

基于区域页级映射的闪存转换层设计

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摘要: 针对固态硬盘中闪存不能进行本地更新操作以及擦写次数有限的特性, 基于多通道并行结构的固态硬盘, 提出一种基于区域的页级地址映射方案, 将连续逻辑页分配到不同的通道中并利用三级地址映射方法. 利用动态和静态损耗均衡算法, 提出了分层的损耗均衡算法和垃圾回收方案. 分析表明该算法能释放固态硬盘内存空间, 延长固态硬盘的寿命, 提高整体性能, 映射表内存占用相对传统页级映射减少近 70%.

关键词: 固态硬盘; 多通道结构; 闪存转换层; 地址映射; 损耗均衡

Design of a Region-Based Page Mapping Flash Translation Layer

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Abstract: In allusion to the shortcoming of lacking in-place write and the limited erasing operations of flash memory in SSD (Solid-State Drive), this paper proposes a region-based page level address mapping algorithm considering the multi-channel architecture of SSD. The algorithm assigns continuous logical pages to different channels and imposes three-level address mapping method, besides, a scheme of hierarchical wear-leveling and garbage collection method is proposed in the basis of dynamic and static wear-leveling algorithm. Theoretical analysis shows that the algorithm we proposed can release memory space in SSD, prolong the life-span of SSD and improve the whole performance, the memory usage of mapping table can be decreased by nearly 70% compared with original page-level mapping method.

Key words: solid-state drive; multi-channel architecture; flash translation layer; address mapping; wear leveling

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